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Choice

Farmer . . . or caretaker?

More and more farmers around the country must make tha decision as they face today's rapid growth in contract farmin and other forms of vertical integration.

Increased coordination of agriculture and business is in evitable. Improved technology and industrialization hav brought us a big consumer market. On one hand, our busines firms aim to furnish this mass of consumers with products c standardized quality at low cost. On the other hand, thes businesses aim to build volume and stabilize supplies in orde to reduce unit costs and increase profits. So retailers (such a food chains) join with processors through contracts or direc ownership. Processors (beet sugar companies are one example contract with farmers to assure a flow of material. And sup pliers (feed makers, for instance) contract with farmers t expand and regulate the market for a product.

Farmers may enter into these contracts to assure price, t shift risk, to obtain capital, or to have a market.

The question is, How far are farmers willing to go in sharin their management responsibilities? The way farmers thin and act will largely determine how integration develops.

For one thing, farmers can move to get markets improved— in some cases through public grades and standards—to provid for standardized production without contracts.

Then, too, farmers can make greater use of cooperatives t buy supplies, provide services, and market products. Thi could help producers retain more of the control as well as larger share of the financial benefits from integration.

One of the most important influences of all can be researcl Integration-stimulated pressure for efficiency is creating ne interest in agricultural research among businessmen and farm ers alike. Free access to improved varieties, breeds, ration and equipment through publicly supported research will enabl farmers to be more independent in choosing contracts. Fu thermore, such research should be able to develop not onl profitable new technology but also arrangements (such a insurance) that might suit farmers better than direct integratio

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BREEDING LEANNESS INTO HOGS

Individual animals selected for their greater-than-average leanness or fatness will transmit part of that advantage or disadvantage to their offspring

How fast and how much can you change the lean-to-fat ratio in hog carcasses through selective breeding? This is being answered through basic studies at USDA's Agricultural Research Center, Beltsville, Md.

In three generations of selection in Duroc hogs, choice for low fat *decreased* backfat thickness by 11 percent, while selection for high fat *increased* backfat thickness by 14 percent. Animals chosen with significantly less backfat than herd average transmitted about 41 percent of that advantage to their offspring. On the other hand, animals chosen with more backfat than herd average transmitted about 57 percent of that disadvantage. Thus, selection was somewhat more effective in increasing backfat than in decreasing it.

Carcass samples of third-generation Duroc hogs bred for leanness gave 3 percent more in yields of trimmed hams, loins, and shoulder butts than the hogs bred for fatness. At the same time, the specially bred fat-line Durocs averaged 0.6 percent higher in bacon yields and 5 percent higher in percentage of other fat cuts.

This means that for every 200-pound Duroc marketed, third-generation lean-line pigs averaged 6.2 pounds more lean cuts and 10 pounds less fat cuts than fat-line animals. The latter yielded 1.2 pounds more bacon.

These differences are large, of course. But progress in separating the lean-to-fat ratio in succeeding generations of the two lines may not be as rapid.

Selection in the Yorkshire breed is giving similar results. But more data are needed on the Yorkshires to tell just how effective selection will be in this breed.

Fat hog's lean cuts have best table quality

Tests of lean tissue for fat distribution and flavor showed that fat Durocs—with 15 percent more intramuscular fat—produced roast pork with more tenderness, flavor, and juiceness than did lean Durocs. Carcass and flavor data for these tests are being provided by ARS food technologist R. L. Hiner and his associates.

ARS geneticist H. O. Hetzer is developing by selection a line high in fatness and one low in fatness in each of the two breeds. Primary criterion of selection is backfat thickness at a live weight of 175 pounds. Only secondary consideration is being given to such traits as litter size, growth rate, and conformation.

The average difference in backfat thickness between the lean-line and fat-line Durocs was 0.4 inch in the first generation, 0.19 in the second, and 0.37 in the third. Average backfat thickness in the foundation stock was 1.49 inches. This increased to 1.70 inches in third-generation fat-line Durocs, and decreased to about 1.33 inches in third-generation lean-line Durocs.

Researchers believe the difference in lean-to-fat ratio will become more pronounced as selection continues.

Selection gives long, lean hog or short, fat one

Results also showed that selection for low backfat has tended to increase length and height and decrease body width, while selection for high backfat has generally resulted in shorter, lower, and wider bodied hogs.

State agricultural experiment stations and private breeders, as well as USDA, have been working for years to improve purebred hogs and develop superior crossbreds for efficient pork production. Selection for carcass quality in swine based on backfat thickness was started at Beltsville in 1954, an outgrowth of increasing interest in the meat-type hog (Agr. Res., September 1953, p. 8: September 1956, p. 10). The Beltsville studies, part of this overall plan, are providing useful data on the value of selective breeding in producing meat-type hogs.

These studies will be continued as long as selection is effective in changing the lean-to-fat ratio. ☆

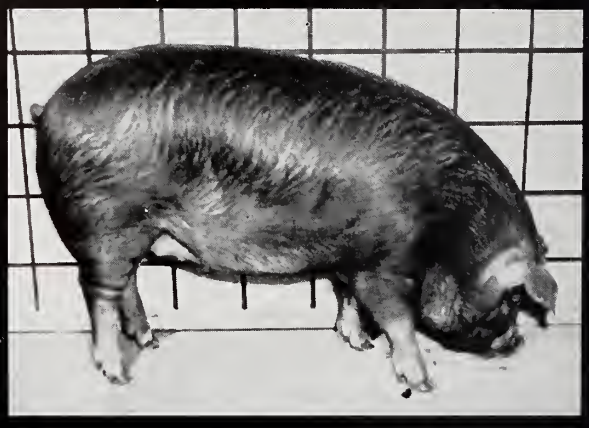
TURN PAGE

LEAN-METER makes use of difference in electrical conductivity of fat and muscle. Fat is good conductor; muscle, poor. Purdue's F. N. Andrews, R. M. Whaley developed fast, reliable, painless instrument.

BRED for LEANNESS

LEAN PIG of third generation, above, had 1.34 inches of backfat at 175 pounds live weight, is trim and lang.

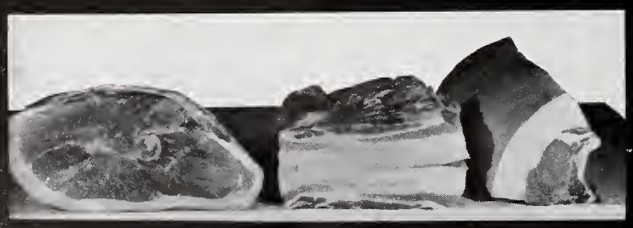
BRED for FATNESS



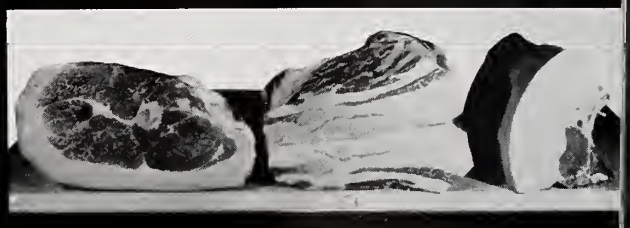
FAT PIG of third generation, above, had 1.93 inches of backfat at 175 paunds live weight, is short and low.

BACKFAT is 1.67 in. at 211-lb. slaughter wt.; carcass is 30 in., aitch bane ta first rib.

FAT carcass yields 2.42 in. af backfat at 213-lb. slaughter wt. Carcass is 27 in.



YIELDS included 15.5% hams, 11.8% bacon, 12.1% loin. Eye muscle area averaged 4.0 sq. in.



EYE-MUSCLE area averaged 2.9 sq. in. Yields included 15.6% hams, 13.8% bacan, 10.5% lain.

WEATHER EYE ON THE RANGE

■ One of the major decisions to be made by ranchers is how to profitably fit their livestock operations to the considerable differences from year to year in forage production on the range. They must scale herds and feed crops to the poorest potential range condition, yet use to advantage whatever grass is produced.

A century ago people generally thought the grasslands were an inexhaustible resource. The westward movement and buildup of livestock, however, led to overgrazing that depleted the range almost before the people became aware of it.

The slow climb to conservation farming began with the Reclamation Act of 1902. Today, 56 years later, we still have a long way to go.

A cooperative study of range conservation and utilization by USDA and the Oregon Agricultural Experiment Station sheds some light on the matter. ARS range conservationists D. N. Hyder and F. A. Sneva suggest two ways to adjust to the recurring weather extremes: (1) delay turnout date until early June, and (2) distribute grazing uniformly.

The amount of green (food-making) leaves per acre during May and early June determines the size of forage production during the rest of the season. Yet, in recent years—regardless of moisture situation—ranchers have turned their herds onto the native grasses about April 1.

A recent study indicated what happens when native grass is overgrazed as late as mid-May. When the grass was clipped to ground level, forage production fell off 60 percent.

The ARS conservationists reemphasize the vigor and productivity of crested wheatgrass as a spring forage. This grass is tolerant of drought and heavy grazing, and is recommended as a grazing crop from late April until early June. Then the native grasses are ready to take over.

One way to better distribute grazing is to truck water to troughs, moving them frequently enough to maintain succulent pasture and to prevent overgrazing. Recent costs of this operation on the Squaw Butte Range, Burns, Oreg., have run from $0.50 to $1.50 per cow-month. The maximum hauling was 3 miles. ☆

VACCINES For FOWL CHOLERA

■ Several test vaccines prepared by USDA scientists look good against fowl cholera, an old poultry killer.

Six experiments were recently conducted with test vaccines. The object was to determine the effect of the method of preparation and dosage on the degree and duration of immunity they conferred on poultry.

ARS bacteriologist K. L. Heddleston and veterinarian W. J. Hall (retired) of the Agricultural Research Center, Beltsville, Md., prepared several types of killed-virus, aqueous, emulsified, and alum-precipitated vaccines. The disease-causing *Pasteurella multocida* organisms were killed by formalin or ethylene oxide.

New Hampshire chickens were vaccinated with the test vaccines. Then doses of *Pasteurella multocida* were given to the birds at various intervals after vaccination. Unvaccinated chickens were kept as controls for each vaccine used on the birds.

The researchers found that a single dose of water-in-oil emulsified vaccine gave excellent immunity for 9 months. It should give adequate protection under industry conditions for the laying year. Researchers feel it's desirable to vaccinate under field conditions where natural outbreaks are prevalent or anticipated.

Work is now in progress to determine the minimum number of bacteria needed per dose of emulsified vaccine to give and maintain high-level immunity. (It has been reported that emulsified vaccines can be diluted 100,000 fold and still be effective, whereas nonemulsified vaccines diluted only 100 fold aren't effective.)

Researchers found that two doses of aqueous-suspended vaccines were more effective than one in maintaining immunity. But a single dose of emulsified vaccine was better than two doses of aqueous vaccine.

The emulsified capsular vaccine (one where an enzyme is used to dissolve bacterial capsules into a suspension) gave effective immunity for at least 25 weeks.

Although the alum-precipitated vaccine was slightly more effective than the chicken embryo vaccine (made from fowl cholera-infected embryos), neither was particularly satisfactory for practical field use. ☆

NEW VIRUS FOUND IN PEAS

Disease of tobacco also injures peas, beans, and some other species

SEVERE lesions on bean leaf show how destructive the disease is.

DEVELOPING young shoots were stunted and injured when plant was inoculated with virus.

■ A NEW VIRUS—the pea strain of the tobacco streak virus—has been isolated from naturally infected peas collected in southern Idaho.

The infection was first noted by USDA plant pathologist W. J. Zaumeyer during a disease survey in 1956. The virus has since been intensively studied by Mexican Ministry of Agriculture's Graciano Patino, who did graduate work at the University of Maryland, and by Zaumeyer.

The virus was highly potent and lasting in storage. All of 30 bean varieties inoculated with it proved susceptible. However, no evidence of seed transmission has been found.

The pea strain of tobacco streak virus produces small areas of dead tissue on beans and other plants. Included among those affected are pepper, soybean, white lupine, petunia, and zinnia, as well as many members of the bean and pea families.

All studies were done in greenhouses at the ARS Agricultural Research Center, Beltsville, Md. The virus was maintained on Pinto and Stringless Green Refugee beans.

Symptoms produced by the virus on beans appeared on leaves in 36 to 48 hours following inoculation. The lesions were reddish brown, less than one-fourth inch in diameter, and sometimes circled with a yellowish ring. Lesions were larger when there were only a few present than when they were numerous. Tissues died along the veins of the inoculated leaves. Severely infected leaves usually dropped from the plant.

About 5 days after inoculation dead areas showed up on the leaf petioles and stems. Leaflets systemically infected showed yellow stipple-like spots followed by dying of the veins and veinlets. In cases of severe injury, the leaflets were malformed.

Severe systemic infection caused the stem joints to redden and often killed the plant. Those that did not die were severely stunted. Although most of the pots of infected plants were normal, some developed reddish ringed patterns similar to those produced by the red-node virus. In general, the symptoms produced by the new virus were milder than those produced by the red-node type.

The virus was inactivated when held between 143° F. and 147° F. for 10 minutes. In fresh plant juice the virus proved infectious when diluted 200 times but not when diluted 4,000 times. It withstood storage in juice at 72° F. for 26 but not for 27 hours, yet was very infectious after storage for 98 days in dry bean tissue at room temperature. ☆

Excess N Won't Help Oranges

■ APPLYING ABOVE-NORMAL AMOUNTS of nitrogen or varying the times of application has no commercially significant effect on the quality or yield of Valencia oranges in Central Florida.

This was shown in a 6-year study by USDA scientists W. Reuther, P. F. Smith, G. K. Scudder, Jr., and Gustav Hrnciar in an orchard of Fosgate Growers Cooperative, near Montverde, Fla.

The tests included three different timing schedules. In addition to the customary equal applications given in the fall, at bloom, and early summer, single applications were made in the fall on some plots and at bloom on the remaining plots.

Two rates of nitrogen averaging about 1.5 pounds (normal) and 3.0 pounds per tree were practically indistinguishable in the results obtained from the long field trial. ☆

A search is under way for a

NEMATODE-RESISTANT CITRUS ROOTSTOCK

Many varieties are being tested in the hope of controlling pest through crop's genetic makeup

■ We're looking for citrus-rootstock varieties resistant or tolerant to the burrowing nematode. They'd be invaluable if we have to live with this destructive pest.

This nematode (microscopic "eelworm") burrows into the roots of citrus and other host plants and destroys root cells, thus interfering with the nutrition of the tree. The pest is causing extensive losses on several thousand acres of infested citrus trees scattered through central Florida and is continually spreading.

Present work entails screening more than 1,500 varieties, species, and relatives of *Citrus* for burrowing nematode resistance. An effort will also be made to produce a rootstock with the desired characteristics by means of artificially induced mutations or breeding.

Work is being conducted cooperatively by USDA and the Florida Agricultural Experiment Station at Lake Alfred. The research is under the direction of W. A. Feder, of ARS, and H. Ford, of the Station.

More than 500 citruses have been screened. For the initial test, seeds from the USDA variety collection and from the Florida station were germinated in flats.

After 6 weeks the seedlings were transplanted to screenhouse beds of soil infested with burrowing nematodes. The nematode population in the soil was kept well distributed and at a high level by growing successive crops of okra, a highly susceptible host, in the beds.

The seedlings were dug and the roots examined after 6 weeks of exposure to the nematodes. The vigor and thriftiness of these seedlings and the amount of root and top growth were recorded. The number of lesions on the tap roots were counted and the entire plant was incubated to recover the nematodes within the roots.

Some stocks show resistance, but not enough

The plants fell into three main groups: ones highly susceptible, ones showing some tolerance, and ones indicating some degree of resistance. No plant, however, resisted initial penetration of the roots by nematodes.

Root appearance varied. Some were badly damaged with large lesions, swellings, discoloration, and cortex sloughing. Some had many lesions but little discoloration or destruction. Still other roots showed few lesions and destruction ranging from little to much.

SPARSE FOLIAGE, fruitlessness of trees are telltale signs that the destructive burrowing nematode is at work on the roots. This parasite spreads through the soil at about 30 feet a year.

One plant of unknown lineage, designated Clone X, was found growing successfully in a declining grove. Rooted cuttings of this plant grew well in nematode-infested soil. When the plant was moved to sterile soil, the nematode population dropped low. Though Clone X shows resistance by supporting only a low nematode population, the feeder roots can be damaged if many of the pests are available from an adjacent host plant.

There is evidence that some rootstock varieties may show tolerance to nematode attack, apparently growing well in spite of a heavy nematode burden. A few plants seem to show a considerable degree of resistance. However, no material screened to date has shown enough promise to be propagated and tested on a large scale.

Meanwhile, ARS and the State Plant Board of Florida are cooperating in an effort to contain the pest. The plan provides for ARS pest-control scientists to make surveys and give laboratory assistance and the State agency to remove infested trees and fumigate the soil—the only present measures of combating the pest. ☆

Helping Oth

IRAQI extension workers, trained by U. S. scientists in basics of pest control, teach farmers to fight crop pests with chemicals.

FARMER in Pakistan gets ready to spray crops against leafhopper, an important pest in his land. The basic information and methods he has learned under foreign aid will boost crop yields.

ARABIC "agricultural quarantine" sign shows Iraq has adopted a western technique. Entomologists show how to fumigate plants.

ETHIOPIAN on a termite hill shows U. S. spray planes where locusts are concentrated. The Ethiopians have been taught how to curb termites in timbers and insects on crops.

ENTOMOLOGISTS in a tent laboratory are field-testing various aldrin formulations for use in a serious locust infestation in Pakistan.

AFGHAN plant-protection officer in white coat shows villagers new pest-control techniques that he learned from American scientists under the foreign-aid plan. Here, they mix insecticides.

's Help Themselves

Pest-control techniques developed for our own farmers are being shared with farmers abroad

FARMERS IN THE SEMIARID lands of the Middle East and North Africa are discovering that modern chemicals and airplanes are powerful weapons against locusts.

For centuries, these hungry pests have been sweeping over this ancient part of the world leaving ruined crops and starvation in their wake. Several methods of combating these insects were tried with only moderate success until spraying by airplane was introduced.

With assistance from the U. S. Mutual Security Program—popularly known as point 4—and aerial equipment, Iran and Iraq were prepared this year for the invading swarms of the desert locust (migratory grasshopper). Using their own recently acquired fleets of airplanes, resident pilots who had been trained under point 4 sprayed large areas with insecticides and stopped the advance. Crops were saved and the people of Iran and Iraq will have more food to eat this year.

Assistance became possible when an agreement under the Mutual Security Program was made in 1951 between USDA and the International Cooperation Administration to help cooperating countries develop practical insect control. The ARS Plant Pest Control Division gives technical direction. Headquarters are at Rome.

First U. S. entomologists under this arrangement went on request of the Iranian Government to help train its people in fighting locust outbreaks in the desert. With crops at stake, U. S. technologists flew 10 tons of chemicals to Iran in 3 large transports and several small planes. American pilots flew the small planes and sprayed, while Iranians continued to spread bait. The locusts were destroyed. This dramatic demonstration convinced the Government of Iran that it should have its own aerial control. But the country needed airplanes, spraying equipment, pilots, and entomologists for this work.

Countries are adopting our modern methods

This objective was met with the assistance of point 4 technologists. When the locusts returned in 1953, Iran had equipment and trained men of its own. Now Iran has 30 spray planes and an effective plant-protection organization that controlled the 1958 locust invasion, with only emergency supplies from us.

Other Middle East countries also developed aerial spraying with the aid of U. S. technologists. Iraq purchased 21 airplanes, Pakistan 20, and last year Afghanistan officials introduced aerial spraying of the Senn pest. This was a great improvement over the old practice of letting smoke from hay fires blow across the fields of food grains to discourage the insects.

ARS has given valuable assistance to many Near East countries for effective control of numerous kinds of insect pests. In western Pakistan, demonstrations were made on nursery stock to control a stem borer destroying food crops. Farmers who tried the same methods had a high percentage of borer control and raised their yield 50 percent over the previous year's yield.

As countries develop effective controls for specific pests, U. S. entomologists assist the countries' technicians in combating other insects. Last year Iran independently carried out control of 10 major crop pests on 1,792,000 acres and 7,860,610 fruit and nut trees. Iranian entomologists also reared 80 million parasites (*Microphanurus semistriatus*), which were released to attack the eggs of the Senn pest. Last year, when the black scale threatened their olive crop, Iranian landlords paid for the material and labor that were necessary to eliminate it.

Quarantine protection is also being planned

Thus, the kind of training and technical aid that ARS is providing to fight insects in India, Afghanistan, Lebanon, Pakistan. Iraq. Jordan, Ethiopia, Libya, Egypt, Turkey, and Tunisia is already beginning to pay dividends for the farmers of these countries.

As a further means of curtailing insect damage to crops, Afghanistan and other countries of the Middle East and southern Asia are now considering laws for establishing plant-quarantine controls on exports and imports. Fruits and nuts will be inspected for insects and diseases before shipment outside the country and this will help to improve market prices. Likewise, imported products will be checked to prevent introduction of harmful insects and diseases.

As effective control measures and trained personnel have demonstrated positive benefits, financial support of local governments has increased and U. S. dollar support decreased in many countries. As the technical cooperation program advances and pests are brought under control, famine becomes less threatening. ☆

A WAY TO USE LINTERS IN PAPER

UNTREATED linters fibers here magnified do not enmesh well. That is why they do not strengthen paper as much as cotton should.

HYDROXYETHYLATED linters shatter (as above) when beaten in paper machine. Branche enmesh and give satisfactory reinforcement to other rag-paper ingredients, ARS study shows.

LINTERS (far right) are removed from seeds before they are crushed. Limited in strength, linters miss a large market for short-fiber cotton for papermaking.

Chemically treated fibers branch finely, mat well, and give strength to paper

■ STRENGTHENING COTTON LINTERS by chemical modification may boost the use of these extremely short fibers in making rag-content paper, according to scientists at USDA's Southern utilization division at New Orleans.

Linters, the short fibers left on cottonseed after ginning, are removed at the oil mill as a byproduct before the seed is processed into oil, meal, and hulls. The price of linters generally averages 10 to 16 cents a pound. Linters go into such products as gunpowder, mattresses, upholstery stuffing, and absorbent cotton.

Linters have had limited use in papermaking because the mills have not been able to develop from linters the same strength obtained from long cotton fibers.

A major source of supply of long cotton fibers has been textile clippings. However, the blending of cotton and synthetic fibers is increasing, thus causing a problem. Synthetics can't be used in papermaking and it's almost impossible to separate them from the cotton. Consequently, a good percentage of the supply of textile clippings is now lost to paper manufacturers.

Linters use limited until fibers are improved

Currently, linters constitute only about 35 percent of the cotton fibers in rag-content paper. Any appreciable increase in the use of linters depends on finding some way of improving the characteristics in the short fibers needed to add strength to paper.

In papermaking, the tiny fibers of cotton, wood pulp, or other useful components are suspended in water and beaten like a cake batter. Beating the fibers is necessary to partially shatter them to the point where they have tiny branches. These branches all mat together in the paper machine, forming a thin blanket of paper.

Untreated linters do not form as many of these tiny branches. Because there are fewer branches to mat, linters paper has less strength and tears far too easily. Similarly, linters paper cannot resist folding as well as paper made with regular cotton fibers.

Cooperative study explored three possibilities

Research was conducted at the ARS laboratory in New Orleans in cooperation with Crane and Company and Southern Chemical Cotton Co. The research followed three chemical avenues: decrystallization, cyanoethylation, and hydroxyethylation. The first two offered no commercial possibilities, but the third, hydroxyethylation, shows some promise by creating tiny fibers on the linters.

Hydroxyethylation includes immersing the linters in a sodium hydroxide solution and centrifuging to damp-dry them. The cotton is then placed in an airtight reactor, flushed with nitrogen to remove the air, and flooded with carbon tetrachloride containing about 3.8 percent ethylene oxide. After reaction, the solution is neutralized, and the linters are washed and dried.

Research indicates that chemical modification of linters may give them the characteristics needed in papermaking, thus assuring the paper industry a firm supply of cotton while broadening the market for linters. ☆

VIRUS Moves Through DEAD Tissues

Study indicates virus does not require cells for movement through the plant, as previous evidence has seemed to show

■ DISCOVERY BY USDA scientists that southern bean-mosaic virus *or its infectious particles* move from dead to living plant cells, may give a new approach to chemical control of virus-caused diseases in farm crops.

Plant pathologist I. R. Schneider and biological science aide J. F. Worley, of ARS, are working on the theory that *the smaller particles*, rather than the complete virus, moved from dead water-conducting cells into living cells of the test plants.

Further research may confirm this theory and show that the moving particles are largely nucleic acid. Such acids in various forms and in combination with proteins comprise the basic makeup of viruses. Nucleic acids alone from other viruses have been known to cause virus infections.

Enzyme destroys particles

Previous research by others has shown that the nucleic acid in tobacco mosaic virus can be made ineffective by the enzyme known as ribonuclease. This substance, which can be obtained from any living organism, will not, however, destroy the tobacco mosaic virus in complete form (that is, protein plus the nucleic acid).

Chemical control is hoped for

For this reason, the scientists believe that these smaller infectious particles of the southern bean-mosaic virus may be more easily controlled than the complete virus. Such control would involve the use of chemicals as seed or soil treatments, leaf sprays, or similar means. The purpose of these treatments, the scientists explained, would be to inhibit movement of the infectious particles and prevent an increase of the virus in a new location within a plant.

At present, there is no known practical way to control plant virus diseases with chemicals, including antibiotics. Prevention of virus movement throughout a plant's system, however, would greatly reduce disease severity, the scientists said.

Control of virus-caused diseases in plants is now largely a matter of preventing spread of these infections from plant to plant by cropping practices, by development of plants resistant to viruses, or by control of insects that transmit virus diseases.

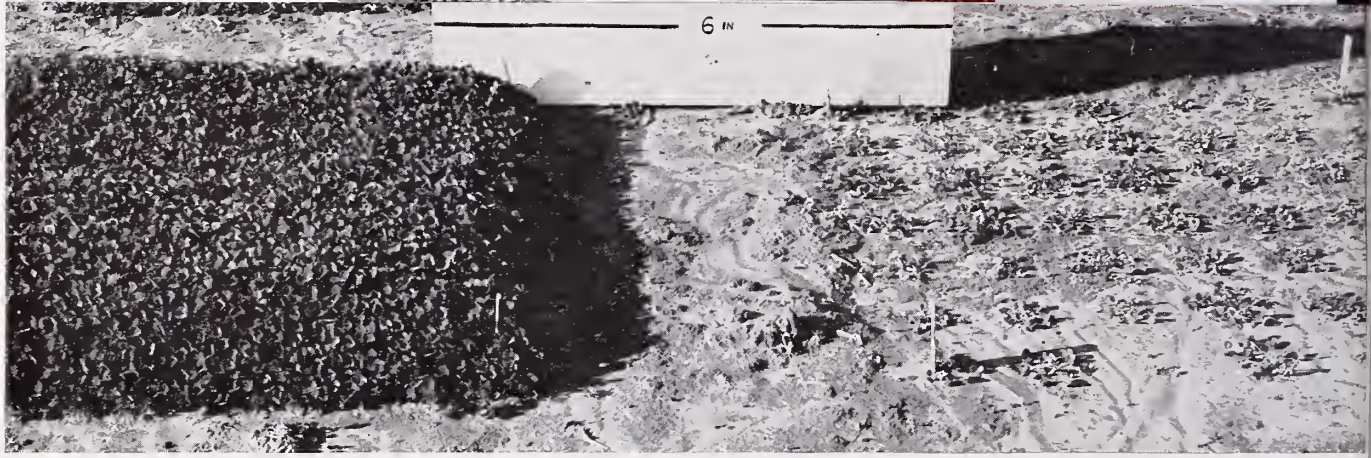
Virus diseases in plants are worldwide. Such diseases affect many important food and fiber crops produced in the United States and frequently cause heavy losses to farmers.

The work done by the two virologists at USDA's Agricultural Research Center, Beltsville, Md., gave the first evidence of southern bean-mosaic virus transport from nonliving plant cells into uninjured living cells.

Virus moved and increased

In this experiment, the scientists killed stem sections of bean plants with steam and introduced the virus into water-conducting cells of the plants below the killed areas. Later they found virus disease symptoms and virus multiplication in living cells well above the killed areas. ☆

STEM TISSUES of this bean were killed with steam just below the crotch. Virus was injected into water-conducting cells below dead tissue. Then typical halo-like symptoms of the disease appeared on leaves above dead area (see far right). Scientists think small virus particles may have gone through.



HOW TO SPACE CRIMSON

Correct management of this versatile and important soil-building crop can give Southern cattle growers high-quality pasture needed for continued expansion of the industry

■ CRIMSON CLOVER shapes up as an even more important forage crop for southern and western coastal States than we've generally thought. State-USDA research has shown us how we can raise it to greatest advantage.

This research indicates that by seeding at optimum rates and fully utilizing the clover, it's possible to get a good yield of high-quality forage just when forage is greatly needed.

Crimson clover has long been one of the most widely grown annual winter legumes. It's chiefly used for soil improvement and grazing. Rapid expansion of the livestock industry in the South has created an interest in growing crimson clover for good winter and spring forage.

Agronomists W. E. Knight and E. A. Hollowell, of ARS, in cooperation with the Mississippi Agricultural Experiment Station, recently completed a 4-year study at State College on the effects of stand density of crimson clover on forage yields, seed production, and disease incidence.

Knight and Hollowell grew crimson clover plants spaced three-fourths to 6 inches apart. The researchers measured the effects of the spacings on height and number of vegetative stems, on number of flower heads per plant and flowers per head, and forage yield at full bloom.

The two men took periodic soil temperature readings in the upper half inch of soil on selected critical dates at various temperature extremes. And they clipped the stands one winter to determine the effect of forage removal on the crown rot disease caused by *Sclerotinia trifoliorum*. Plots were clipped when clover was 6 inches high, leaving a 3-inch stubble.

Dense stand has advantages

This research showed that dense stands of crimson clover produced earlier fall and winter growth and much greater yields of high-quality forage than thin stands. But thin stands produced good seed yields, always a welcome source of cash.

There was a close relationship between stand density and growth rate during each of the 4 years. For example, in 1955, plants spaced three-fourths inch averaged more than 7 times the height of those spaced 6 inches apart. The plants spaced three-fourths inch made 6 inches growth and were ready for clipping by early November, whereas those spaced 6 inches didn't attain this much growth until February.

Dense stands of crimson clover produced high-quality forage in the fall when green forage is usually scarce. For instance, plants spaced three-fourths inch produced an average of 10,634 pounds of green forage per acre by December, with a dry matter content of 18.3 percent. A similar yield from plants spaced 6 inches apart didn't occur until March.

In one year, plants spaced three-fourths inch apart averaged 4,013 pounds of dry matter per acre more than plants spaced 6 inches apart.

Both green- and dry-forage yields varied widely with seasonal differences, of course. But in all cases, yields increased with stand density.

On the other hand, stand density had a marked—but reverse—effect on the number of vegetative stems and seed heads. Plants spaced three-fourths inch averaged 1.1 seed heads and 1.5 stems per plant; those spaced 6 inches apart averaged 15.7 seed heads and 18.7 stems per plant.

Thin stands produce more seeds

The ability of crimson clover to compensate for thin stands by branching is clearly shown by the increase in vegetative stems per plant. The large number of seed heads produced as a

DIFFERENCES in growth of crimson clover due to different spacings show up clearly in picture taken in late November. Greater forage yield, earlier fall growth were obtained from densely planted plot of crimson clover at left. These plants were spaced three-fourths inch apart, whereas those on the right were spaced 6 inches apart. Dense stands developed earlier under both favorable and unfavorable weather conditions.

CLOVER

result of branching could be important if self-seeding is intended.

Dense stands of crimson clover generally produced fewer seeds. In one year, plants spaced three-fourths inch averaged 158 pounds less seed per acre than plants spaced 6 inches.

Clipping meets disease threat

Dense stands of crimson clover were damaged by *S. trifoliorum* when the forage wasn't clipped. Clipping during the growing season gave good control one year, but reduced the total forage by 609 pounds per acre. Seed yields were reduced an average of 89 pounds per acre. But remaining forage was of much higher quality than that from unclipped plots.

Surface soil temperatures also contributed to growth differences of crimson clover. Dense growths did not have to contend with such extreme temperatures as occurred under thin stands. The soil didn't freeze under dense stands when it did under thin stands. Lower maximum temperatures under thick stands also appeared to conserve soil moisture in the fall.

This study has led to additional research. The scientists hope to develop methods of obtaining dense crimson clover stands by mid-fall from volunteer seedlings in association with grass. And they are trying to learn the effect of each microclimate factor on plant growth. ☆

Rice MUTANT Looks Favorable

■ A NEW EARLY-MATURING RICE MUTANT with possibilities for breeding new varieties was created through atomic radiation, in cooperative research by USDA and the Louisiana Agricultural Experiment Station.

In 1952, seeds of the aristocratic Rexoro variety were irradiated at the Atomic Energy Commission's Brookhaven National Laboratory. They produced a mutant that matures 4 or 5 weeks earlier than Rexoro.

The seed was sown at the Rice Experiment Station at Crowley on June 11, 1952, by N. E. Jodon, ARS agronomist connected with the study. Rexoro is a late variety and early cold weather that fall prevented seed production. However, some plants survived the mild winter—100 plants from seeds that had been treated with X-rays and 37 from seeds that had received thermal neutron treatment, a form of atomic radiation.

Many of the first-generation plants were largely sterile, but most produced at least a few seeds. Progeny were grown from 95 of those in the X-ray group and 35 in the neutron group in 1954. Various plants resulted. Some were albinos and others yellow, but all these died for lack of chlorophyll. Some pale-green mutants appeared and survived. The next year some yellowish seedlings grew and matured.

Changes in maturity were found in five rows planted to second-generation seeds from this source. Two rows had a shorter growing period. Two rows contained late-maturing plants with leaves thicker than normal. In the fifth row, a single plant was discovered maturing even before it was time for Rexoro to head out.

Seed from this plant in turn produced uniform plants maturing about 4 weeks earlier than Rexoro. This early-maturing Rexoro mutant produces typical Rexoro grains, but has fewer tip awns and very few tillers. The straw is apparently not as tall as normal Rexoro.

It is unlikely that producers will ever grow this early mutant for the market, but other early varieties with the high quality of Rexoro may be bred from crosses of the new strain with commercial rice. ☆

NEW MUTANT OF POPULAR REXORO rice seems to have most of the fine qualities of original variety plus outstanding earliness. Rexoro (four plants at far right) was radiated to cause mutation. Mutant (other plants) resembles Rexoro.

GETTING RID OF HONEYSUCKLE

SPRAYING with herbicide 3-amino-1,2,4-triazole at right killed honeysuckle. Unsprayed bed, left, thrived.

■ LOW-COST METHODS of controlling Japanese honeysuckle on forest areas are under study by USDA's Forest Service at Hitchiti Experimental Forest, Macon, Ga. This vine prevents reestablishment of trees. Honeysuckle thrives and competes with timber on some 10 percent of forest land from Georgia to Maryland.

Two of 13 experimental chemical mixtures reduced density of cover as well as vigor of new sprouts when first applied. A second application practically eliminated the honeysuckle.

One of the effective herbicides is a 2-to-1 mixture of the butoxyethanol esters of 2,4-D and 2,4,5-T (1⅓ pounds of the former and ⅔ pound of the latter, acid equivalent, in 65 gallons of water). The chemicals can be bought premixed in that ratio or separately to be formulated.

The other mixture is 10 pounds of 50-percent 3-amino-1.2,4-triazole wettable powder and 5 ounces of a wetting agent in 125 gallons of water.

Both mixtures are also effective in killing the kudzu vine.

Research has shown that costs can be lessened by first harrowing and disking the more heavily infested honeysuckle areas. Six weeks later, when a new cover has become established, the areas are sprayed.

Chemical spraying on areas of several acres is most efficiently done with a power sprayer equipped with hose and adjustable nozzle. A cone-shaped spray provides good coverage of the foliage. On smaller areas, a low-pressure, back-pack pump is best.

Small patches can be controlled by mulching with a 2-inch layer of sawdust. This smothers the vine and deprives it of necessary nitrogen.

Honeysuckle prefers fertile, nitrogen-rich land, where it often completely covers shrubs and saplings. The vine spreads until nitrogen-poor sites are encountered. In dense pine forests, fallen needles and shade keep it in check. But in open stands, honeysuckle covers the ground, preventing new trees from starting.

Excellent food for game, especially deer, the vine shows promise in areas devoted to wild life. It provides good winter grazing for cattle, which generally gain weight for short periods. But if timber production is the primary object of the landowner, honeysuckle must be checked. ☆

Irradiation's no Help on Nematode

■ USDA SCIENTISTS IN SEARCH of a practical method of killing nematodes found them to be unexpectedly resistant to radiation.

The golden nematode. small worm-like parasite of plants, can withstand 20,000 roentgens before the females are sterilized, according to tests at the ARS Agricultural Research Center, Beltsville, Md., and Brookhaven National Laboratory, Long Island. It takes 120,000 roentgens or more to kill this pest. By comparison, 650 roentgens is considered invariably fatal to man.

Since nematode-killing doses of radiation injure plants, there's no prospect of using it to kill the pests in living plants.

Scientists had hoped that nursery stock now being quarantined to prevent spread of nematodes could be freed of the parasites by exposing them to radiation. The scientists had also hoped to find a practical method of killing nematodes on potatoes grown in nematode-infested soil. They must look elsewhere. ☆

Livestock systemic OK'd

USDA now recommends the use of Bayer 21/199, which is commercially available, for control of certain livestock pests. The new recommendation was issued as a supplement to Agriculture Handbook No. 120, published by USDA last February.

This compound has been accepted for registration under pesticide regulation laws. It may be used with proper precautions on beef cattle for the control of cattle grubs, horn flies, lice, ticks, keds, and screwworms, and

on swine for the control of lice and screwworms.

Bayer 21/199 shouldn't be used on sick animals or calves less than 3 months old, and isn't recommended for dairy cattle or milk goats. It's necessary to delay slaughtering for 60 days after the final application.

One of this compound's most beneficial uses is for screwworm control. A single treatment destroys existing infestations and usually protects against reinfestation until the wounds heal, or 7 to 14 days. It is being used routinely in the Federal-State screwworm quarantine program in Florida to treat livestock moving from infested into uninfested areas.

New soybean of merit

A new yellow-seeded soybean, Hood, has been released by the U. S. Regional Soybean Laboratory at Urbana, Ill., and cooperating State agricultural experiment stations.

There should be enough stock for extensive commercial planting in 1960. Seed for 1959 increase plantings can be obtained from county agricultural agents, seed improvement organizations, and State experiment stations, but not from USDA.

This new soybean is similar to Ogden—a leading variety—but has slightly higher seed yields, seed quality, and seed-holding ability. Hood yielded 6 percent more seed than Ogden in the East Coast area and 9 percent more in the Delta area. Hood's oil content was somewhat higher, protein slightly lower.

Hood is adapted for production in Delaware, Maryland, Virginia, North Carolina, Kentucky, Missouri, Arkansas, and Oklahoma. It is resistant to bacterial pustule, wildfire, frogeye, and target spot.

The original selection from which Hood was developed was F_3 line from a cross of Ogden and CNS at the North Carolina Agricultural Experiment Station. Later, this line was crossed with Roanoke for higher oil content and seed-holding qualities.

Herbicides in safer form

Granular herbicides may widen possibilities for chemically controlling weeds without damaging crops, according to results of recent research by USDA and cooperating State agricultural experiment stations.

Such herbicides as CIPC and DNBT in granular form were successful in experimental weed control among a wide range of woody ornamental nursery plants. Granular herbicides were also effective against weeds in tomatoes, Irish potatoes, strawberries, and other crops.

Because granular herbicides remain in contact with foliage only momentarily before reaching the soil, they do little or no damage to crops. Some chemicals harmful in spray form may be safe in granular form.

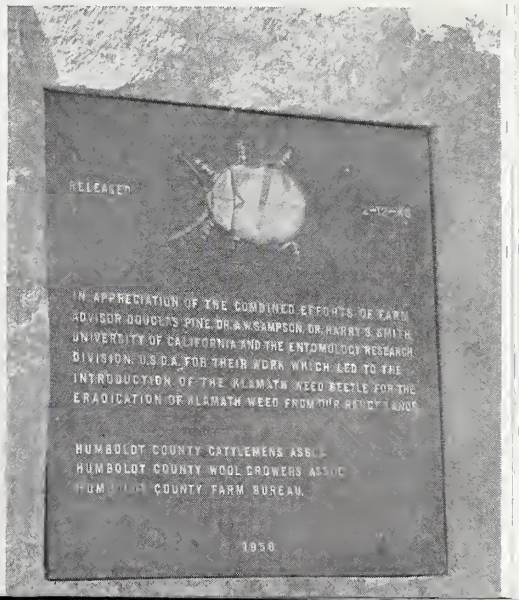
Experiments have also been made in pelletizing a few new herbicides, including 2,3,6-TBA, fenuron, and monuron, for soil treatments in brush control. Researchers believe pellets can be applied in desired concentrations to spot areas of brush, either by airplane or ground equipment.

A bow to a good beetle

The people of Humboldt County, Calif., have erected a memorial to the insect that freed their ranches of the toxic Klamath weed. The memorial, recently dedicated by ARS Administrator B. T. Shaw, commemorates the first attempt in the U. S. to control a weed with a plant-eating insect (AGR. RES., July 1955, p. 5).

The beetle *Chrysolina gemellata* has cleared more than a half-million acres of the weed that once choked the range in California, Oregon, Washington, Idaho, and Montana.

This success story began when reports came from Australia of an imported beetle that was eliminating the weed in that country. Soon thereafter, USDA and the California Agricultural Experiment Station set up a



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cooperative project to import, test, and breed these insects.

The tests showed that the beetle would feed and reproduce only on the Klamath weed, and in 1946, five thousand of these insects were released in Humboldt County. Land owners cooperated wholeheartedly. Today, the beetles are established in every county where the Klamath weed grows. Forage plants are coming back, and all indications are that these insects will hold the weed in check.

Sending research abroad

Scientific institutions in Great Britain and Israel recently received grants under a new USDA plan to finance foreign research aimed at expanding markets for farm products.

British institutions received 8 grants totaling nearly $1 million, and Israeli institutions received 3 totaling $370,000. Work on the approved projects—to be financed up to 5 years—will get underway immediately. Plans are presently being developed for research in several other countries, and to finance studies by contracts as well as by grants.

The new foreign development research plan was developed recently by officials of ARS and Foreign Agricultural Service. Research projects will be financed by foreign currencies accruing abroad from sale of our surplus commodities, under the Agricultural Trade Development and Assistance Act of 1954, better known as Public Law 480.

There will be close coordination between domestic and foreign utilization research. Foreign studies will be concentrated on finding new and improved uses for surplus commodities. Both basic and applied research will be conducted, with more emphasis to be devoted to basic studies.

Countries can be included in this plan if they have scientific institutions able and willing to undertake the research, and also have available the Public Law 480 funds.

Several considerations are guiding selection of research projects. Results should help develop new markets in both countries and help agricultural science generally. Also, special knowledge or techniques in foreign institutions may help solve research problems more quickly than here. In addition, contracts between science and industry may help bridge gaps between research accomplishment and actual expansion of markets.

Two British grants are for basic studies on cotton, 4 on food preservation, 1 on wool, and 1 on deterioration of leather. The Israeli projects are on cotton, cereal grains, and fruit and vegetable processing.

Stop lygus on limas

Correct timing of insecticidal treatments to control lygus bugs can increase lima bean yields by as much as 200 to 250 pounds per acre.

USDA entomologists M. W. Stone and F. B. Foley found that an early application of DDT just after blossoming began, or an intermediate application about 2 weeks later when the pods appeared, gave the most significant increase in yield. Applying in-

secticides late in the growing period when the pods were 1½ to 2 inches long was not as effective.

In tests at Whittier, Calif., all treatments cut the percentage of pitted beans caused by the bugs. The intermediate application and combined early and late applications were most effective against such damage.

Peak populations of lygus bugs are likely to occur in the first half of August. This indicates the need for applying the insecticide 2 weeks after blossoming to prevent damage to the small and half-mature pods present on the plants in August. Treatment at this time will also reduce damage caused by corn earworms.

Two States certified

Michigan and New Mexico have been declared modified-certified brucellosis free, joining 13 other States, Puerto Rico, and 570 counties in 28 other States in achieving this status. Certification means that not more than 1 percent of all cattle and not more than 5 percent of all herds can be affected with brucellosis. New Jersey and Utah are the other most recently certified States.

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